Summary: P201 #1-4; P204 #5-8; P205 #3-7

P201

1)
%mass Ca = 0.90g ÷ 2.50g X 100% = 36%
%mass Cl = 1.60g ÷ 2.50g X 100% = 64.0%

2)
Total mass = 7.22g + 2.53g + 5.25g = 15.00g
%mass Ni = 7.22g ÷ 15.00g X 100% = 48.1%
%mass P = 2.53g ÷ 15.00g X 100% = 16.9%
%mass O = 5.25g ÷ 15.00g 100% = 35.0%

3)
mass of O = 650mg - 257mg - 50.4mg = 343mg
%mass C = 257mg ÷ 650mg 100% = 39.5%
%mass H = 50.4mg ÷ 650mg X 100% = 7.75%
%mass O = 343mg ÷ 650mg X 100% = 52.8%

4)
mass O = 50.0g - 13.3g - 17.7g = 19.0g
%mass K = 13.3g ÷ 50.0g X 100% = 26.6%
%mass Cr = 17.7g ÷ 50.0g 100% = 35.4%
%mass O = 19.0g ÷ 50.0g 100% = 38.0%

P204

5)
a)
$M(N_2O)$ = 44.02 g/mol
%mass 2N in N_2O = 2(14.01g/mol) ÷ 44.02g/mol X 100% = 63.65%

b)
$M[Sr(NO_3)_2]$ = 211.64 g/mol
%mass 2N in $Sr(NO_3)_2$ = 2(14.01g/mol) ÷ 211.64 g/mol X 100% = 13.24%

c)
$M(NH_4NO_3)$ = 80.06 g/mol
%mass 2N in NH_4NO_3 = 2(14.01g/mol) ÷80.06 g/mol X 100% = 35.00%

d)
$M(HNO_3)$ = 63.02 g/mol
%mass 1N in HNO_3 = 14.01 g/mol ÷ 63.02 g/mol X 100% = 22.23%

6)
$M(H_2SO_4)$ = 98.09 g/mol
%mass 2H in H_2SO_4 = 2(1.01 g/mol) ÷ 98.09g/mol X 100% = 2.06%
%mass 1S in H_2SO_4 = 32.07 g/mol ÷ 98.09 g/mol X 100% = 32.69%
%mass 4O in H_2SO_4 = 4(16.00 g/mol) ÷ 98.09 g/mol X 100% = 65.25%

7)
$M(KNO_3)$ = 101.11 g/mol
%mass 3O in KNO_3 = 3(16.00g/mol) ÷ 101.11 g/mol X 100% = 47.47%

8)
a) $M(MnO_2)$ = 86.94 g/mol
%mass 1Mn in MnO_2 = 54.94 g/mol ÷ 86.94 g/mol X 100% = 63.19%
%mass 2O in MnO_2 = 2(16.00g/mol) ÷ 86.94 g/mol X 100% = 36.81%

b) mass of Mn = 63.19% X 250kg = 158kg

P205

3)
$M(C_{16}H_{10}N_2O_2)$ = 262.28 g/mol
%mass 2O in $C_{16}H_{10}N_2O_2$ = 2(16.00 g/mol) ÷ 262.28 g/mol X 100% = 12.20%
mass O in 25.0g of indigo = 12.20% X 25.0g = 3.05g

4)
$M(KClO_3)$ = 122.55 g/mol
%mass 3O in $KClO_3$ = 3(16.00 g/mol) ÷ 122.55 g/mol X 100% = 39.17%
Therefore, mass of O in 24.5 g of $KClO_3$ = 39.17% X 24.5g = 9.60 g

5)
$M(Ag_2O)$ = 231.74 g/mol
%mass 2Ag in Ag_2O = 2(107.87 g/mol) ÷ 231.74 g/mol = 93.10%
Therefore, mass of Ag in 18.4 g Ag_2O = 18.4 g X 93.10% = 17.1 g

6)
According to data on box, %mass Na in $NaHCO_3$ = 0.137g ÷ .500g X 100% = 27.4%
$M(NaHCO_3)$ = 84.01 g/mol
% mass of 1Na in $NaHCO_3$ = 22.99 g/mol ÷ 84.01 g/mol X 100% = 27.4%
Therefore, the claim on the box is accurate.

7)
Let's assume one mole of soap.
Since it contains 12C atoms, the mass of C in the soap is 18mol X 12.01g/mol = 216.18 g
Since C is 70.5% of the mass of the soap, than the one mole of soap has a mass of:
216.18g ÷ 0.705 = 307 g
The alkali metal has a %mass of 100% - 70.5% - 11.5% - 10.4% = 7.6%
Therefore, in one mole of soap, there is 307g X 7.6% = 23.3g
The question says there is one alkali metal cation. Since 23.3g is very close to the mass of one mole of Na (22.99g), therefore the cation must be Na.